

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

REMARKS

Applicant respectfully asks for reconsideration of both this application and the Office Action dated June 15, 2004. Entry and consideration of this Amendment are thus courteously requested.

Applicant gratefully thanks the Examiner for the personal interview of September 14, 2004. This Amendment is presented in accordance with the substance of that interview

A response to the Office Action of June 15, 2004, was due by September 15, 2004. Applicant therefore has attached a Petition for a one month extension of time. The Commissioner is hereby authorized to charge the associated small entity Petition fee of \$55, along with any other fees deemed necessary to maintain the pendency of this application (including any fees under 35 U.S.C. §1.16 and §1.17), to the deposit account of the undersigned, Deposit Account No. 19-0733. Please consider this Amendment as timely filed.

This Amendment presents two new dependent claims in excess of twenty total claims. Accordingly, the Commissioner additionally is authorized to charge the associated extra claim fees of \$18 to Deposit Account No. 19-0733.

Claims 12-16, 18-23, 35, 45-54, 107-110, 113-115, 118-120 and 137-139 were pending in this application. New claims 140 and 141, which depend from claims 12 and 45, respectively, are newly presented herein in order to further claim various embodiments of the invention. More particularly, new claims 140 and 141 are presented to further recite that the transfer function applied by the optical device changes the duration of the first optical signal.

Based upon Applicant's personal interview, Applicant has then amended claims 12 and

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

45 to more specifically recite that each diffractive element of the invention individually provides reciprocal focusing. For example, claim 12 is amended to recite that each of the plurality of diffractive elements individually provides reciprocal focusing between the first port and the second port. Similarly, claim 45 now recites that each diffractive element individually acts to provide reciprocal focusing between the first port and an output port. Support for this amendment may be found, for example, in the specification from page 14, line 19 to page 15, line 16. As agreed to during the interview, Applicant respectfully submits that these amendments to claims 12 and 45 serve to further patentably distinguish the claimed invention from the prior art cited by the Examiner.

Claims 12, 137 and 138 also are amended herein, to more broadly recite the ports so that they encompass, for example, any specific location at which an optical signal enters or exits the substrate. Also, claims 16 and 54 are amended herein to more particularly recite that optical device and the diffractive elements, respectively, form a temporal cross-correlator. Support for this amendment may be found in the specification at, e.g., page 3, lines 17-21 and from page 15, line 25 to page 16, line 4.

In the Office Action of June 15, 2004, the Examiner rejected claims 35, 113-115, and 137-139 under 35 U.S.C. §112, first paragraph. Specifically, the Examiner asserted that "the recitation of 'a second plurality of diffractive elements' is not described in the specification or shown in the drawings." (See Office Action, page 2, lines 20-21.) Applicant respectfully traverses this rejection, and courteously requests its withdrawal.

Applicant respectfully invites the Examiner's attention to the portion of the specification

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

at page 14, lines 16-25. This part of the application discusses that a programmed holographic structure may be comprised of a sum of structures each of which individually maps signals between selected ports. The application goes on to define a programmed holographic structure that maps input signals from one input port to one output port as a "primitive" programmed holographic structure or a primitive structure. (See page 14, lines 26-30.) It then discloses that an overall distributed diffractive holographic structure may be the sum of one or more primitive programmed holographic structures (that is, the sum of one or more different groups of diffractive elements). The specification further explains that multiple primitive programmed holographic structures may occupy the same spatial region. (See page 14, lines 30 to page 15, line 1.) Applicant also notes that the application clarifies programmed holographic structures to be comprised of diffractive elements. (See page 12, lines 11-14.)

Thus, Applicant respectfully submits that the specification fully and clearly discloses an optical apparatus comprising both a first plurality of diffractive elements that apply a first transfer function to an optical signal (i.e., a first primitive programmed holographic structure) and a second plurality of diffractive elements that apply a second transfer function to an optical signal (i.e., a second primitive programmed holographic structure). Applicant therefore submits that the language of claims 35, 113-115, and 137-139 does not constitute new matter, and asks that the rejection of these claims under 35 U.S.C. §112, first paragraph, be withdrawn.

Next, claims 12-16, 23, 45-54 and 107 were rejected under 35 U.S.C. 102(b) over U.S. Patent No. 4,824,193 to Maeda et al. Applicant respectfully traverses this rejection as well, and asks for its reconsideration.

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

The Maeda et al. patent discloses simple multiplexer/demultiplexer holograms, for breaking up a single wave of incident light into separate light waves of its component frequencies, with the separated light waves propagating along different directions (like rainbow colors after passing through a prism) or for combining different waves of incident light (each having a different frequency and input direction) into a single output light wave. Notably, the Maeda et al. patent teaches that this type of hologram is formed by interfering an aspherical wave front with another aspherical or spherical wave front. (See, e.g., column 1, lines 62-67.) Applicant respectfully submits that the simple multiplexer/demultiplexer holograms disclosed in the Maeda et al. patent operate in a wholly different manner from the holographic filter of the invention. Accordingly, the Maeda et al. patent does not teach or suggest the features of the invention recited in the rejected claims.

For example, each of claims 12-16, 23, 45-54 and 107 recite applying a transfer function to a first optical signal to produce a second optical signal having a different spatial waveform shape and a different temporal waveform. Claims 46 and 52 more particularly recite that the transfer function includes spatial information, while claim 50 particularly recites that the transfer function includes spectral information. Nothing in the Maeda et al. patent, however, would teach or suggest applying a transfer function to an optical signal. Instead, as previously noted, the Maeda et al. patent only teaches demultiplexing input light into its component frequencies (or the reverse), without imparting any information content to that input light.

In addition, claims 12-16, 23, and 107 recite an optical device with a substrate, a first port, a second port, and a plurality of diffractive elements, such that each of the diffractive

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

elements individually provides reciprocal focusing between the first port and the second port. Similarly, claims 45-54 recite diffracting a first optical signal via diffractive elements such that each diffractive element individually acts to provide reciprocal focusing between a first port and an output port. As discussed in detail during the personal interview, the Maeda et al. patent does not teach or suggest these features of the invention. Instead, the Maeda et al. patent describes a hologram where only the combination of all of the diffractive elements, working together, focuses incident light from the input optical fiber 7 to the output optical fibers 8 (or vice versa).

With particular regard to claims 16 and 54, these claims specifically recite that the optical device of the invention forms an optical waveform cross correlator. There is simply nothing in the Maeda et al. patent, however, that would teach or suggest this feature. The claims have been modified to specify that the optical device of the invention comprises a temporal waveform cross correlator. The temporal waveform cross-correlation concept is well known in the art and represents a multiplication and integration of temporal waveforms at various time delays. The concept is used in the analysis of radar signals, detection of acoustic signals, and a variety of other things. Temporal waveform cross-correlation is not an intrinsic feature of holographic structure or function.

Applicant therefore again submits that the Maeda et al. patent does not teach or suggest the features of the invention recited in claims 12-16, 23, 45-54 and 107. It is therefore requested that the rejection of these claims be withdrawn.

Next, claims 18-20, 35, 137 and 138 were rejected under 35 U.S.C. §103 over the Maeda et al. patent in view of U.S. Patent No. 4,140,362 to Tien. Applicant respectfully traverses this

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

rejection, and courteously requests its reconsideration.

First, Applicant respectfully points out that the Maeda et al. and Tien patents could not be combined in the manner suggested by the Examiner. As previously noted, the the Maeda et al. patent teaches a hologram formed by interfering an aspherical wave front with another aspherical or spherical wave front. The Tien patent, however, teaches a holographic diffraction grating formed by "two cylindrically focused beams of coherent optical radiation." (See, e.g., column 1, lines 40-45.) The Examiner has provided no explanation, however, as to how someone of ordinary skill in the art could combine the teachings of these patents without invalidating the different physical principles underlying the construction of the holograms taught in these patents.

Second, the combination of the teachings of the Maeda et al. and Tien patents would still not teach or suggest the features of the invention recited in these claims. The Tien patent does not remedy the omissions of the Maeda et al. patent discussed in detail above. With particular regard to claims 137 and 138, these claims recite a second plurality of diffractive elements that apply a second transfer function to an optical signal. The Examiner has suggested that the Tien patent discloses this feature, referring only generally to Figures 2A-2C, 2E and 2G for support. Applicant respectfully points out that Figures 2A and 2B, Figures 2C and 2D, Figures 2E and 2F, Figures 2G and 2H, Figures 2I and 2J, and Figures 2K and 2L, each illustrate one implementation of a diffraction grating according to the teachings of the Tien patent, and each of these implementations consists of only one diffraction grating. None of these figures discloses a single optical device having two distinct groups of diffractive elements.

Claims 108-110 and 118-120 were then rejected under 35 U.S.C. §103 over the Maeda et

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

al. patent in view of U.S. Patent No. 5,165,104 to Weverka. Applicant respectfully traverses this rejection, and asks for its reconsideration as well.

It is respectfully noted that claims 108-110 and 118-120 recite the use of a planar waveguide. As known by those of ordinary skill in the art, a planar waveguide is a thin waveguide that effectively limits wave propagation to two dimensions (i.e., in a direction parallel to the "plane" of the waveguide). Applicant further points out that the Maeda et al. holograms cannot be implemented within a planar waveguide, as they only function on light incident or at least emergent from above the plane of the hologram (i.e., light that has a propagation component perpendicular to the plane of the hologram).

Applicant additionally points out that the Weverka patent does not remedy the numerous omissions of the Maeda et al. patent discussed in detail above. It is therefore submitted that no combination of the Weverka and Maeda et al. patents would teach or suggest the invention as recited in any of claims 108-110 and 118-120. Applicant therefore again asks that the rejection of these claims be withdrawn.

The Examiner next rejected claims 113-115 and 139 under 35 U.S.C. §103 over the combination of the Maeda et al., Tien and Weverka patents. Applicant respectfully traverses this rejection, and courteously requests its reconsideration. As discussed in detail above, no combination of these patents would teach or suggest the features of the invention recited in claims 113-115 and 139. Applicant therefore asks that the rejection of these claims be withdrawn.

Lastly, claims 21 and 22 were rejected under 35 U.S.C. §103 over the Maeda et al. patent

U.S. Pat. App. No.: 09/811,081
Atty. Docket No.: 006349.00001

alone. Applicants respectfully point out that, as discussed in detail above, the Maeda et al. patent does not teach or suggest various features of the invention recited in these claims. It is therefore requested that this rejection be withdrawn as well.

In view of the above amendments and remarks, Applicants respectfully submit that all of the claims are allowable, and that this application is therefore in condition for allowance. Applicants courteously ask for favorable action at the Examiner's earliest convenience.

Respectfully submitted,

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